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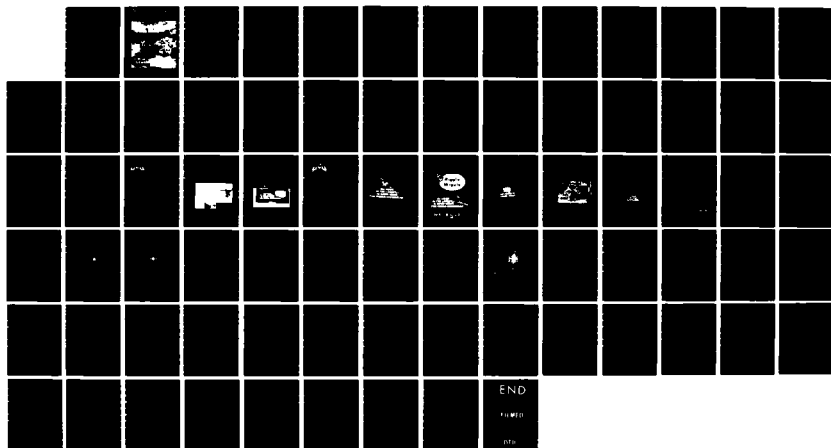
FARGO-MOORHEAD URBAN STUDY ENERGY CONSERVATION APPENDIX  
RECYCLING THERMOGRAPHY(U) CORPS OF ENGINEERS ST PAUL MN  
ST PAUL DISTRICT MAY 85

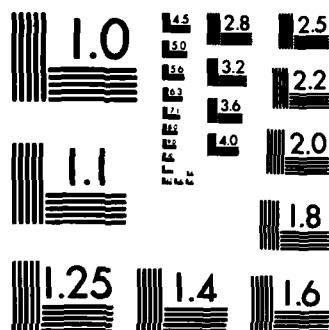
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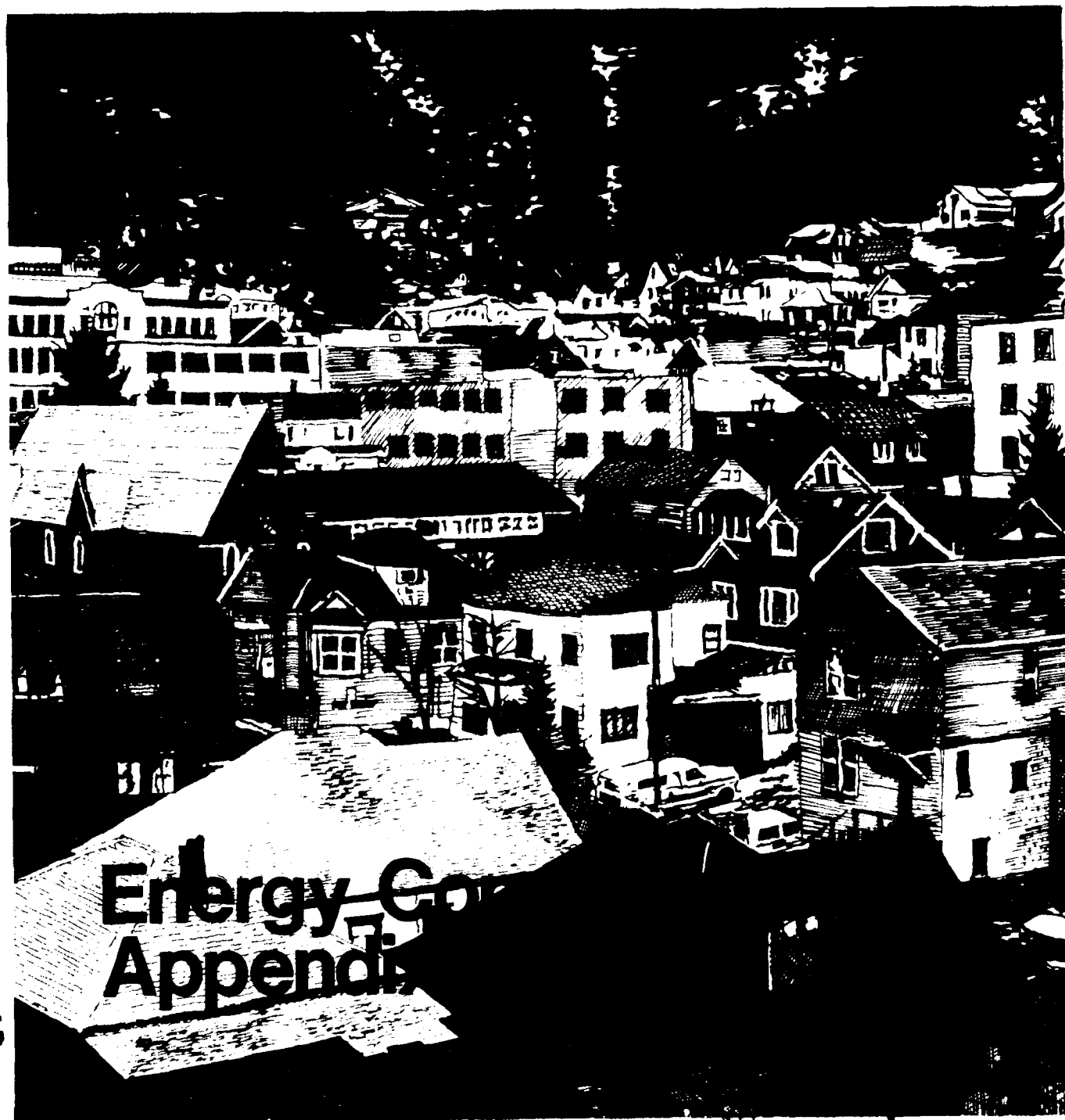
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May 1985

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Fargo-Moorhead Urban Study is a cooperative Federal, State and local planning effort aimed at developing viable solutions to water and related land resource problems, needs and concerns for 1980-2030.  The summary report contains a brief, non-technical overview. Readers desiring additional detailed information should review the appropriate technical appendixes.  Two subjects are suggested in this study: thermography and recycling.		

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**FARGO-MOORHEAD URBAN STUDY**  
**ENERGY CONSERVATION APPENDIX**

**RECYCLING**  
**THERMOGRAPHY**

St. Paul District, Corps of Engineers  
1135 U.S. Post Office and Custom House  
St. Paul, Minnesota 55101-1479

**MAY 1985**

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## PREFACE

The Fargo-Moorhead Urban Study was sponsored by the St. Paul District, Corps of Engineers, as a cooperative effort of local, State, and Federal agencies. The results of this study are contained within the following documents:

- o Summary Report
- o Background Information Appendix
- o Water Supply Appendix (3 Volumes)
- o Water Conservation Appendix
- o Energy Conservation Appendix
- o Flood Control Appendix
- o Fargo-Moorhead Water Resource Data Management System Appendix (3 Volumes)

The Summary Report contains a brief, non-technical overview of the results of the overall study. Only readers desiring additional detailed information should review the appropriate technical appendixes.

## ENERGY CONSERVATION APPENDIX

### INTRODUCTION

#### THE U.S. ARMY CORPS OF ENGINEERS ADDRESSES ENERGY CONSERVATION

The chain of events that led to the Fargo-Moorhead Urban Study addressing energy conservation began with Public Law 95-619 (the National Energy Conservation Policy Act, dated November 9, 1978). This law was the congressional response to Executive Order 12003 (signed by President Carter on July 20, 1977). Part 3, Section 541(5) of Public Law 95-619 requires the Federal Government to be a pacesetter in energy conservation.

The Army plan was developed in response to Executive Order 12003, Public Law 95-619, and other administration and congressional actions. This plan declares (as stated in Army Regulation 11-27) that one of the Army's objectives is to "participate in the national effort to conserve energy resources." In an April 14, 1978, letter on civil works energy conservation actions, the Office of the Chief of Engineers (OCE) in Washington, D.C., informed Corps of Engineers field offices that "the Army Energy Plan was recently published setting forth Army goals and objectives. . . . These goals and objectives apply fully to all elements of the U.S. Army Corps of Engineers."

OCE notes that Army goals and objectives include attaining "a position of leadership in the pursuit of national energy goals." The April 14, 1978, OCE letter states: "The Chief of Engineers desires that the Corps maintain its position of national leadership by innovative planning and vigorous actions to conserve and wisely use energy in all non-renewable forms."

OCE reaffirmed its commitment to promoting greater awareness of and participation in energy conservation by promulgating the Corps of Engineers Energy Plan (originally released April 15, 1980, and revised July 14, 1980). This plan discussed "actions that may be taken by an Installation Commander to promote energy conservation" and listed "Corps established initiatives for energy conservation." Several of the actions and study topics suggested by OCE were considered for the Fargo-Moorhead Urban Study.

#### ENERGY CONSERVATION AND THE URBAN STUDY

The Corps urban study program is intended to provide direct planning assistance to communities and local interests in a variety of subject areas, including some not within traditional Corps responsibility and involvement. Urban study regulations list a number of possible study topics and allows for others, subject to approval. Therefore, the urban study program provides an excellent and practicable means for the Corps to initiate and fulfill a pacesetter role in energy conservation planning.

#### SELECTION OF ENERGY CONSERVATION TOPICS

St. Paul District, Corps of Engineers, personnel coordinated with study area representatives and Corps higher authorities during the selection of energy conservation subjects. At the time the Fargo-Moorhead study began, OCE had not promulgated guidance on the scope and level of detail for energy conservation consideration in planning studies. Therefore, the St. Paul District and local representatives jointly developed a preliminary scope that included time and cost estimates. Six subjects were suggested in this scope:

- o Thermography
- o Promotion of recycling
- o Low-head hydropower



- o District heating expansion
- o Solid waste incineration/heat recovery
- o Wind power

Recommendations from the Corps North Central Division (in Chicago, Illinois) and changing local priorities later reduced the list to two subjects:

- o Thermography
- o Promotion of recycling

The following sections in this appendix discuss the urban study's efforts in these two subject areas.

**FARGO-MOORHEAD URBAN STUDY**

**RECYCLING**

## TABLE OF CONTENTS

<u>Item</u>	<u>Page</u>
I. SUMMARY	1
II. PROJECT NEEDS AND OBJECTIVES	2
III. PROCEDURES	4
Recycling Committee	4
Selection of Marketing Consultants	5
Market Analysis	5
Marketing Strategy	7
Implementation of the Marketing Program	8
Project Monitoring	9
IV. RESULTS, CONCLUSIONS, AND RECOMMENDATIONS	9
V. REFERENCES	14
VI. EXHIBITS	16

LIST OF EXHIBITS

<u>No.</u>		<u>Page</u>
1	Scope of Services for a Marketing Program	16
2	News Release by Audio Media	19
3	Dumpsters	20
4	Billboard	21
5	Listing of Billboard Locations	22
6	Sample of Advertisement in <u>The Forum</u>	23
7	Recycling Slogans Printed on Grocery Bags	24
8	Button with Recycling Slogan	25
9	Newspaper Article	26
10	Newspaper Article	27
11	Daily Public Notice in <u>The Forum</u>	28
12	Agreement Between Fargo and Huschke Recycling	29
13	Agreement Between Moorhead and Huschke Recycling	30
14	Monthly Listing of Newsprint Recycled	31
15	First Place Award. F-M Advertising Competition (Newspaper Category)	32
16	Merit Award. F-M Advertising Competition (Complete Campaign)	33

## I. SUMMARY

This report was prepared in compliance with the scope of services (exhibit 1) for the Fargo-Moorhead Urban Study's energy conservation recycling project. This recycling project resulted from the growing concern among the local governments regarding long-term solutions to the problem of municipal solid waste disposal. The urban study's energy conservation and water supply investigations had related concerns about possible effects of solid waste disposal. In particular, urban study involvement revolved around the concept of recycling reusable materials to save energy and to reduce the potential for contaminated leachate from landfills.

The purpose of the project was to develop and conduct a promotional campaign that would encourage residents and businesses in the Fargo-Moorhead area to recycle newspapers.

The newspaper recycling campaign was undertaken as a joint project between the cities of Fargo, North Dakota, and Moorhead, Minnesota, in cooperation with the Fargo-Moorhead Metropolitan Council of Governments. A recycling committee consisting of appropriate officials from the two cities was established to oversee the successful completion of the project.

Audio Media, Inc., a marketing firm from Fargo, was awarded a contract to develop and implement an effective marketing program. Development of the program was based on a review of past and ongoing recycling efforts and an analysis of available marketing alternatives. Emphasis was placed on supplementing rather than duplicating ongoing recycling efforts in the private sector.

The recycling campaign was designed around the slogan "NO NEWS IN THE LANDFILL IS GOOD NEWS FOR FARGO-MOORHEAD!" Various media outlets were used, including television, radio, newspapers, and grocery bags. The

newspaper recycling campaign was an outstanding success as the monthly volume of newspaper collected for recycling increased by an average of 446 percent during the campaign. This increase in volume translated into various short-term and long-term benefits, including savings in energy and transportation costs, extended life of area landfills, preservation of the environment and natural resources, increased public awareness, and favorable attitudes toward recycling.

Based on the positive results of the newspaper recycling campaign, this report concludes that the project was a success, and it recommends that similar recycling campaigns continue to be implemented periodically in the future and that their scope be expanded to products other than newspapers and beverage cans if other recycling is economically feasible.

## II. PROJECT NEEDS AND OBJECTIVES

Recycling of materials such as newspapers and beverage cans has been a topic of interest for Fargo-Moorhead area communities in recent years. An effective recycling program can play a key role in energy conservation and in preserving the environment in many ways. Some benefits of recycling are described as follows in the scope of services:

Reducing the quantity of solid wastes generated by a community can cut the number of truckloads hauled to municipal incinerators and landfills. Fewer truckloads translates into less fuel consumption, and reduced incineration cuts the potential for air pollution and the amount of noncombustibles and ash to dispose of. Recycling extends the life span of existing landfills, thereby relieving the need for new landfills, which generally must be built at less and less desirable sites and at greater and greater distances from the metropolitan area. Because the best suited landfill sites are already in use or might be occupied for other purposes, it

costs much more to adapt less suitable sites, and it increases the risk of leachate escape and possible groundwater contamination.

The City of Moorhead is the main depositer of municipal solid waste in the Clay County Landfill, approximately 20 miles to the east of the city. This landfill is filling rapidly. Recent technical studies and surveys indicate that the remaining life expectancy of the Clay County Landfill is 3 to 4 years at the most. The Clay County Commission is thus under pressure to find long-term and short-term solutions to solid waste disposal problems. A task force consisting of elected and appointed officials from Clay County is actively pursuing various related issues such as:

- o Reduction of solid waste volumes via recycling, incineration/composting, or other means.
- o Potential of ground water contamination.
- o Acquisition of a new landfill site at a location that does not endanger the area's ground and surface water resources.

The City of Fargo has recently acquired a new landfill site to resolve its short-term solid waste disposal problem. However, city officials recognize that the life expectancy of the landfill is not infinite and that long-term solutions need to be explored.

In 1982, Fargo and Moorhead, in cooperation with the Fargo-Moorhead Metropolitan Council of Governments, requested funds from the St. Paul District, Corps of Engineers, under the ongoing Fargo-Moorhead Urban Study to help with the development and implementation of a promotional campaign to encourage residents and businesses in the Fargo-Moorhead area to recycle newspapers and beverage cans. The primary goals of this project were (1) to increase public awareness of recycling and energy

conservation and (2) to prolong the useful life span of the area landfills and thus help preserve the environment. This funding request was approved, and the following list of project objectives was agreed to in conjunction with the scope of services:

- o Establish a Fargo-Moorhead recycling committee and develop an overall joint strategy for a marketing program.
- o Review status of ongoing recycling efforts.
- o Evaluate local consumer attitudes toward recycling.
- o Assess the local communications media.
- o Develop and implement media campaign material and strategy.
- o Monitor the progress and the results of the marketing campaign.
- o Evaluate and report on the effectiveness of the recycling campaign.

These project objectives are addressed in further detail in subsequent sections of this report.

### III. PROCEDURES

Recycling Committee: In March 1982, Fargo and Moorhead established a joint committee to develop and implement the marketing program for the recycling of newspaper and beverage cans. The membership of this committee included two council persons from Moorhead, two city commissioners from Fargo, the Moorhead Planning Director, and the Fargo Community Development Director. The committee met on a regular basis (approximately once a month) to supervise various phases of the project, including the following:



- o Selection of a marketing consultant.
- o Development and implementation of the marketing strategy.
- o Monitoring and evaluation.

The recycling committee operated in close cooperation with the representative of the St. Paul District, Corps of Engineers. The recycling committee also played a key role in coordinating the effort with Fargo and Moorhead officials.

Selection of Marketing Consultant: In April 1982, a scope of services (exhibit 1) was prepared by the recycling committee and distributed among the marketing consultants operating in the Fargo-Moorhead area. The scope of services highlighted the project organization, the consultant's responsibility, performance criteria, and the program costs. Many local and regional advertising firms were interviewed. Audio Media Corporation of Fargo, North Dakota, was selected primarily because of their reputation and samples of their production work.

Market Analysis: In the 3 months following their selection, representatives of Audio Media Corporation held several meetings with the recycling committee and with various recycling entities operating within the Fargo-Moorhead metropolitan area. These included Huschke Recycling, beverage wholesalers, the Boy Scouts, churches, and other interested parties. The intent was to review the status of ongoing recycling efforts, evaluate consumer attitudes toward recycling, and to develop an effective marketing program aimed at increasing public awareness of and motivation to participate in the community-wide recycling efforts. Various observations resulting from these market analysis efforts are summarized in the following paragraphs:

o Community-wide recycling programs have enjoyed a significant amount of support from Fargo-Moorhead area residents in the past. Various recycling efforts in the area have been initiated during past years. Continuation and success of these programs have depended mainly on financial considerations.

o In the early 1970's, a community-wide program was initiated by the League of Women Voters to collect bottles and other glass articles. This program had to be discontinued shortly after it began because of the lack of market potential for the sale of recycled glass.

o In 1977, the City of Fargo initiated a newspaper collection program in conjunction with the city's garbage collection activities. The residents were asked to separate newspapers from the garbage and put them out in bundles. In addition, both Fargo and Moorhead have provided dumpsters for newspaper deposits in key locations. Both cities have had agreements with Huschke Recycling of Alexandria, Minnesota, to use the dumpsters for a fee. Huschke Recycling, in turn, picks up and hauls the newspapers to Minneapolis, Minnesota, for recycling purposes.

o Huschke Recycling, a private business, also contracts with numerous businesses in the Fargo-Moorhead metropolitan area for the pickup and hauling of cardboard and paper for recycling.

o In March 1982, the recycling committee explored the feasibility of (1) encouraging/requiring local business to separate cardboard for recycling and (2) establishing a special truck route for cardboard pickup in an effort to assist Huschke Recycling with the expanded collection of material for recycling purposes. However, this program was not implemented since the projected costs (\$2,100 per month) would far exceed the anticipated revenues (\$380 per month) to be derived from the program.

o Clay County Development Achievement Center had been involved during past years in collection and sorting of paper as an activity for its handicapped clients.

o A fairly successful community-wide beverage can recycling program has been in place in the Fargo-Moorhead metropolitan area during the past several years, primarily because of the promotional efforts of the Pepsi-Cola Company, the Coca-Cola Company and the beverage wholesalers operating in the area.

o A major emphasis in this recycling campaign was that the proposed marketing efforts would not compete with private efforts. Instead, this campaign would help by generating a broader awareness of recycling, drop points, collections, schedules, and other aspects of all recycling efforts in the Fargo-Moorhead area.

In the original scope of services, the intent of the recycling campaign was to address newspapers and beverage cans. However, the survey of the ongoing recycling activities indicated that the beverage can recycling program was already operating effectively and was adequately supported by an advertising campaign. Consequently, a determination was made by the recycling committee in concurrence with the Corps of Engineers that, instead of duplicating the privately-sponsored beverage can recycling campaign, all resources available to the committee would be used to promote newspaper recycling.

Marketing Strategy: Upon the completion of the market analysis and the determination that the marketing efforts would concentrate on newspaper recycling alone, the Audio Media representatives began work on the design of an effective marketing strategy that was implemented during the spring, summer, and fall of 1983.

The newspaper recycling campaign was designed around the slogan "No News in the Landfill is Good News for Fargo-Moorhead." A news release

circulated by Audio Media in the spring of 1983 (exhibit 2) describes the campaign strategy as follows:

The Administrative Offices of Moorhead, in cooperation with the Administrative Offices of Fargo and Audio Media Corporation have launched a spring and summer campaign encouraging newspaper recycling. The premise of the campaign is "No News in the Landfill is Good News for Fargo-Moorhead" in relation to a problem discovered by both cities. It is apparent that the landfills in Fargo and Moorhead are filling at a tremendous rate and new land for new landfills is both expensive and difficult to find. Newspaper is the main problem, yet it is easily recycled. So, the public is being asked to save their newspaper, put it in in grocery bags and place it in specially marked dumpsters at grocery stores, shopping centers, and other locations.

The campaign includes billboards, newspaper, television, and radio advertising using the mayors of Fargo and Moorhead as spokesmen, buttons (given out to school children) and ads placed on grocery bags at Hornbachers and Piggley Wiggley. Special dumpsters have been painted bright yellow and carry the slogan "Put the Goods News Here."

Implementation of the Marketing Program: The recycling campaign got under way in April 1983 through television and radio public service announcements with Mayor Lanning of Moorhead and Mayor Lindgren of Fargo standing beside one of the specially painted dumpsters (exhibit 3) discussing the need for recycling in the two cities. This promotion was repeated through the months of May and June. At the same time, billboards were erected (exhibit 4 and 5), ads were placed in local newspapers (exhibit 6) and on grocery bags (exhibit 7), and buttons were distributed to all Moorhead-Fargo first and second grade school children (exhibit 8). These efforts were followed up by newspaper articles

(exhibits 9 and 10) and, on a continuing basis, the campaign logo (exhibit 11) was in the newspaper.

Six specially painted dumpsters (exhibit 3) were placed in Moorhead and eight in Fargo. Billboards were placed in 14 key locations throughout the Fargo-Moorhead area. Agreements were entered into between Fargo and Moorhead and Huschke Recycling authorizing the use of dumpsters (exhibits 12 and 13).

Project Monitoring: The planning staffs of Fargo and Moorhead, in cooperation with the representatives of the Huschke Recycling, were responsible for the day to day monitoring of the conduct and results of the newspaper recycling campaign. The recycling committee also continually reviewed progress and directed any mid-course corrections that were necessary.

Daily records were kept of the total tonnage picked up by Huschke Recycling. Monthly totals of the collected newspapers were recorded and compared with the monthly totals of the preceding year.

During the course of the campaign, some shifts were made in the location of the pickup points in response to suggestions from the local citizens. Also, there were occasions when the dumpsters were overflowing with the newspaper deposits (exhibit 10). However, this problem was quickly resolved by arranging more frequent pickups.

#### IV. RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

The main goals of this project were to increase public awareness toward recycling and to help reduce the volume of solid waste being dumped at area landfills. The accomplishment of these goals is quite evident because, during the course of the recycling campaign, the average amount of newspapers picked up for recycling jumped from 16.1 tons per month to 88.1 tons per month for the two cities (exhibit 14). This represents a

72-ton or approximately 450-percent increase for the two cities. According to the Moorhead officials, the tonnage breakdown of newspaper picked up between Fargo and Moorhead is on a 2 to 1 ratio. Applying these ratios, the increase in Fargo's average monthly tonnage attributable to the recycling campaign was 48 tons and the increase for Moorhead was 24 tons per month.

The results of the recycling campaign translated into benefits to the communities as follows:

(1) Transportation/Gasoline Costs and Dumping Fees

City of Moorhead: Moorhead's cost of transporting the solid waste from the city's transfer station to the county landfill is estimated at \$12.50 per ton for 1984. This figure includes costs of operating the transfer facility, staff, operation of the truck on a 40-mile round trip, and the dumping fee at the county landfill. Thus, Moorhead realized a saving of 24 tons/month x \$12.50/ton = \$300 per month or \$3,600 per year by reducing the volume of solid waste transported to the landfill. The savings resulting from the reduced cost of street collection and transportation to the transfer station are not included in this figure and represent additional cost savings.

City of Fargo: According to Dr. Dixie Griffin of North Dakota State University - a consultant to the city on solid waste disposal - the cost of transporting the solid waste (collection costs not included) from the streets to the city landfill is estimated at \$11.90/ton as of November 1983. The newspaper recycling meant a savings of \$571.20 per month (48 tons/month x \$11.90/ton) or \$6,854 per year.

(2) Extended Useful Life of the Landfills

Fargo Landfill: According to the officials at the Fargo Landfill, the total intake of solid waste is approximately 77,000 tons

annually for 297 days of operation. A reduction of 48 tons per month would thus mean:

$$\frac{48 \text{ tons/month} \times 12 \text{ months/year} \times 100\%}{77,000 \text{ tons/year}} = 0.75 \text{ percent}$$

(or 2.2 days savings per year in the useful life of the Fargo Landfill).

Clay County Landfill: The total annual intake of the Clay County Landfill is approximately 32,500 tons at the rate of 625 tons per week. A reduction at the rate of 24 tons per month would lead to a saving of:

$$\frac{24 \text{ tons/month} \times 12 \text{ months/year} \times 100\%}{32,500 \text{ tons/year}} = 0.89 \text{ percent}$$

(or 2.6 days savings per year in the useful life of the Clay County Landfill).

(3) Natural Resource and Energy Savings Realized from Recycling as Opposed to Producing Paper from Virgin Timber: The newspaper collected in the Fargo-Moorhead area is used for producing recycled paper and insulation material, according to Mr. John Moreland of Hushke Recycling. In both cases, the collected newspaper replaces the need for producing paper from the virgin timber, helping to reduce environmental impacts and preserve natural resources. Furthermore, production of recycled paper is more energy efficient in comparison with production from virgin timber. This efficiency is illustrated as follows:

Energy needed to produce paper from virgin timber = 11,400 BTU's per pound or  $22.8 \times 10^6$  BTU's per ton.

Energy needed to produce paper from recycled paper = 8,800 BTU's per pound or  $17.6 \times 10^6$  BTU's.

Net energy savings per ton =  $(22.8 \times 10^6) - (17.6 \times 10^6) = (5.2 \times 10^6)$  BTU's.

Consequently, recycling 72 tons per month would lead to energy savings of  $72 \times (5.2 \times 10^6) = 374.4 \times 10^6$  BTU's per month.

In assigning a dollar value to these energy savings, a determination needs to be made as to the source of energy being utilized for producing paper. Energy costs per BTU vary considerable depending on the source, as illustrated in the following table. This table indicates the various types of fuels used for space heating and for industrial process heating in the metropolitan area. The price per BTU indicates the relative cost of each fuel.

FUELS USED IN THE FARGO-MOORHEAD AREA,  
THEIR ENERGY CONTENTS, AND UNIT PRICES (1984)

<u>Fuel</u>		<u>Price Per Unit</u>	<u>Price Per BTU</u>
Coal	11,000 BTU's/lb.	\$0.015/pound	\$0.000001364
No. 6 Oil	150,000 BTU's/gal.	\$0.85/gallon	\$0.000005666
Natural Gas	103,000 BTU's. /CCF	\$0.72/CCF	\$0.000006990
No. 2 Oil	138,700 BTU's/gal.	\$1.13/gallon	\$0.000008147
Electricity	3,413 BTU's/KWH	\$0.041/KWH	\$0.000012013

From the information in the above table, if No. 6 oil would be used for paper recycling, savings of  $374.4 \times 10^6$  BTU's per month would be translated into:

$374.4 \times 10^6$  BTU's/month  $\times$  \$0.000005666/BTU  $\times$  12 months/year = \$25,429/year.



(4) Increased Public Awareness and Favorable Attitudes Toward Recycling: The newspaper recycling campaign was designed and implemented by the Audio Media Corporation in a very efficient manner. The campaign won awards of excellence in the Twenty Seventh Annual F-M Advertising Federation ADDY Award Competition (exhibits 15 and 16). Simple and to the point slogans were instrumental in bringing about enthusiastic participation from the public as described earlier. The overwhelming success of the initial campaign has encouraged Fargo and Moorhead to undertake a second recycling campaign in April 1984.

Mention should also be made about the residual effect of the newspaper recycling campaign. There was no newspaper recycling campaign activity during the January to March 1984 period. The newspaper pickup rate dropped from an average of 88.1 tons per month to 43.3 tons per month during that period, which was still 170 percent higher than the pre-campaign pickup rate of 16.1 tons per month average (exhibit 14qs).

In conclusion, the newspaper recycling campaign was quite successful in many ways, including increased public awareness, cost savings, energy conservation, and increased life of area landfills. Although the impact in terms of the increased life of the area landfills was somewhat limited for a short-term campaign like this, it is anticipated that, if repeated at regular intervals, efforts such as this will go a long way in developing permanent habits among residents toward newspaper recycling as well as recycling/conservation of other products and natural resources. A community-wide commitment on a continual basis would have significant long-term impact on area landfills and consequently on protection of the environment.

It is recommended that:

- o Fargo and Moorhead continue to explore ways to promote recycling and conservation of natural resources.

- o The newspaper recycling campaign be repeated periodically to maintain public awareness and interest in recycling.

- o If economically feasible, community recycling efforts be expanded to include products other than newspapers and beverage cans.

- o The newspaper recycling campaign material and related information developed as a part of this project be made available to other cities and counties that might be interested in similar recycling campaigns.

#### V. REFERENCES

The following officials and documents provided information pertaining to the completion of this project:

Mr. John Moreland, Huschke Recycling, Moorhead.

Mr. Thomas E. Raster, St. Paul District, Corps of Engineers, Project Manager, Urban Studies Program.

Dr. Dixie Griffin, North Dakota State University Civil Engineering Department and Consultant to City of Fargo for the Landfill Study.

Mr. Emery Stordahl, City of Moorhead, Moorhead, Minnesota.

Officials at Fargo Sanitary Landfill.

Mr. Richard Reis, Director of Planning, Moorhead, Minnesota.

Mr. Maurice Anderson, Assistant Planning Coordinator, City of Fargo.

Mr. Ron Olson, Supervisor of Garbage Utility, City of Fargo.

Mr. Vijay Sethi, Director, Fargo-Moorhead Metropolitan Council on Governments, Moorhead, Minnesota.

Fargo-Moorhead Metropolitan Council of Governments. 1981. Modular Incineration in the Fargo-Moorhead Area - Cost-Revenue Study.

Hayes, Dennis. 1978. Repairs, Reuse, and Recycling - First Steps Taken a Sustainable Society. World Watch.

Wagner, R.E., and D.M. Griffin, Jr. 1983. The Economics of Solid Waste Disposal in Fargo, North Dakota.

Scope of Services for a Marketing Program to Increase  
the Newspaper and Beverage Can Recycling Programs in  
Moorhead, Minnesota and Fargo, North Dakota

To reduce their solid waste streams, extend the life of their landfills and to encourage recycling the City of Moorhead and Fargo desire to conduct a metropolitan newspaper and beverage can recycling marketing program. To do so, the communities desire to hire an experienced professional marketing firm that has the experience in marketing non-traditional products. The firm must demonstrate that it has the expertise and means of conducting and producing the required research, analysis, strategy formulation and media campaign material.

To oversee the development of the marketing program, the consultant shall meet as required with a committee composed of two council persons from Moorhead, two commissioners from Fargo, the Moorhead Planning Director and Fargo's Community Development Director. The Moorhead Planning Director shall serve as the lead person for coordinating activities and handling and dispersing of funds.

The following scope of service requirements are provided to set certain conditions and standards for the consultant to insure full understanding and knowledge of the proposed marketing program.

- To conduct a Fargo/Moorhead newspaper and beverage can current recycling analysis. Consultant activities would include meeting at least once with the various recycling entities in both communities. These would include Huschke Recycling, beverage wholesalers, a boy scout representative, churches and other interested parties. In addition, the consultant would be expected to evaluate in particular the two cities existing newspaper recycling systems and make recommendations regarding bin locations and improvements. The consultant will not be responsible for making recommendations regarding different methods of newspaper or beverage can recycling but rather to concentrate only on the existing systems. The expected timetable is two weeks.

- Conduct a communication situation analysis. Once the base data has been collected, the consultant will evaluate the various communication vehicles available to include public service as well as the paid media options. The evaluation will deal with reach and frequency, values of the media, cost efficiency, programming sequence and project timing to maximize program impact. Estimated time frame: 2 weeks.
- Development of an overall marketing strategy. The consultant meeting with the recycling committee shall develop an overall strategy to implement the recycling marketing program. The strategy shall be in written report form detailing as much as possible the program to include timing, outlining the physical changes to the recycling system if needed, idea and theme development, advertising examples, media determination and implementation schedule. Estimated time frame: 3 weeks.
- Development of media campaign material. The consultant shall be responsible for the development of the materials to conduct the recycling marketing program. The Moorhead Planning Department shall be responsible for inventorying and storage of the campaign material. Estimated time schedule: 3 to 4 weeks.
- Contracting with the media for conduction of the campaign. The consultant shall be responsible for contracting with the various media forms in advance for the total campaign schedule prior to September 30, 1982. Estimated timetable: one week.
- Program finalization. This step consists of monitoring and evaluating the progress and results of the campaign. This action would result in a final project analysis report. The report would be due 3 months after the media campaign has begun.

# RECYCLING MARKETING PROGRAM COSTS

## Estimated Consultant Cost Breakdown

Situation Analysis Phase - 2 people (20 hours)	\$ 700
Communication Analysis and Marketing Strategy Development - 2 people (22 hours)	750
Development of Media Campaign Material (includes time and material) - 3 people (70 hours)	4,000
Final Project Report - 2 people (20 hours)	<u>550</u>

ESTIMATED CONSULTANT COSTS	\$ 6,000
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## Media Campaign Costs

Media Campaign (includes 15% media commission to consultant)	<u>\$14,000</u>
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TOTAL RECYCLING MARKETING PROGRAM	\$20,000
-----------------------------------	----------



Audio and Video Production

FOR IMMEDIATE RELEASE

FROM: AUDIO MEDIA  
112 N. UNIVERSITY DR. SUITE L127  
FARGO, ND 58102

ADMINISTRATIVE OFFICE LAUNCHES NEWSPAPER RECYCLING CAMPAIGN

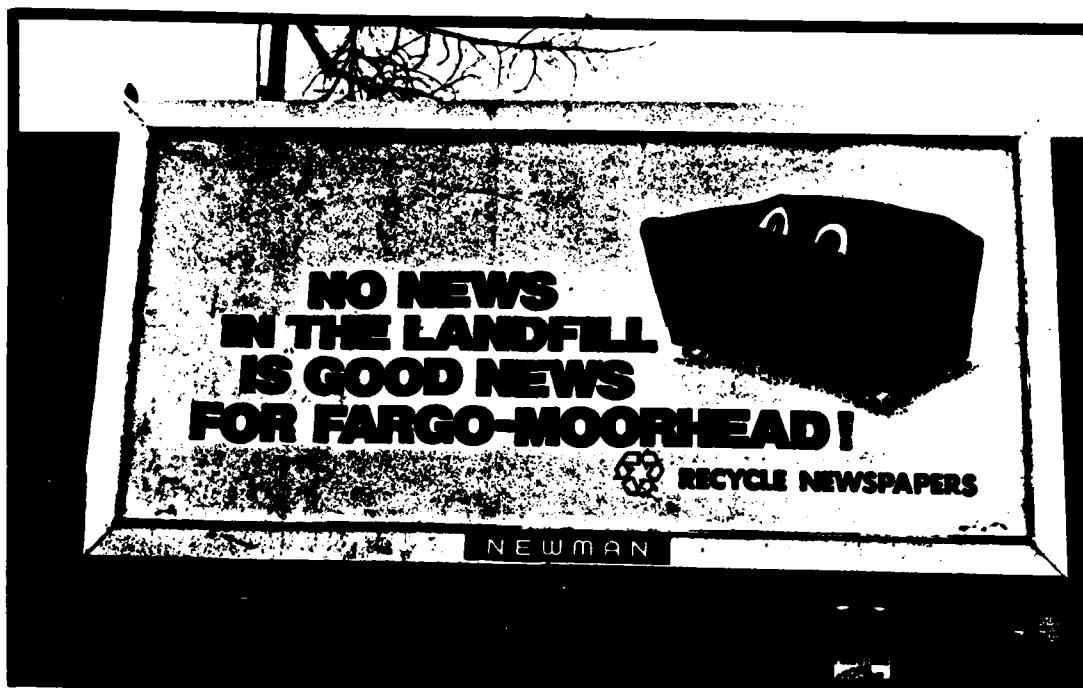
The Administrative Offices of Moorhead, in cooperation with the Administrative Offices of Fargo and Audio Media Corporation have launched a spring and summer campaign encouraging newspaper recycling. The premise of the campaign is "No News in the Landfill is Good News for Fargo-Moorhead" in relation to a problem discovered by both cities. It is apparent that the landfills in Fargo and Moorhead are filling at a tremendous rate and new land for new landfills is both expensive and difficult to find. Newspaper is the main problem, yet it is easily recycled. So, the public is being asked to save their newspaper, put it in grocery bags and place it in specially marked dumpsters at grocery stores, shopping centers and other locations.

The campaign includes billboards, newspaper, television and radio advertising using the mayors of Fargo and Moorhead as spokesmen, buttons (given out to school children) and ads placed on grocery bags at Hornbachers and Piggley Wiggley. Special dumpsters have been painted bright yellow and carry the slogan "Put the Good News Here".

For more information contact:  
Emery Stordahl-Moorhead Administrative Offices-299-5301  
or  
Susan Smith-Audio Media Corporation-237-6863









Audio and Video Production

April 28, 1983

Dear Emery:

As you requested, here are the locations of all the billboards:

Fargo, ND    13th Ave @ 45 St.  
Main Ave. W/O I-29  
Main Ave. W/O 15th  
US 81 S. #2  
I-29 N/O 7th #1  
University Dr. N/O 19th #2  
University Dr. @ 3rd  
Broadway N/O 2nd  
1st Ave. N. @ 7th

Moorhead, MN Main Ave. @ Bridge  
8th St. N/O Main  
Main Ave. @ 13th  
Center Ave. @ 11th  
30th Ave. S. @ 9th St.

I'll call you soon so we can get together and do any additional planning. In the mean time, I'll be putting together some ideas for any different mediums we might be able to use. Talk to you soon!

Sincerely,

A handwritten signature in dark ink, appearing to read "Susan Smith", with a long horizontal flourish extending to the right.

Susan Smith



# NO NEWS IN THE LANDFILL IS GOOD NEWS FOR FARGO-MOORHEAD!

No good news/bad news jokes, just some straight talk about a growing problem in the Fargo-Moorhead area.

The landfills in both cities are filling up fast . . . faster than necessary. And new facilities would be both expensive and wasteful of our resources.

But there is something you can do to help. Newspaper is the single biggest waste item, yet easily recycled into such items as new paper products and insulation. Both city governments have combined to "clean up" the problem. They've set up thirteen collection centers in both cities. The rest depends on you.

We're asking you to collect your old newspapers, put them in grocery bags and drop them in specially marked, bright yellow dumpsters at these convenient Fargo-Moorhead locations

Watch for them & please help.

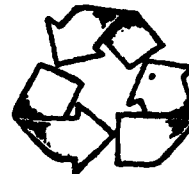
## FARGO LOCATIONS

Hornbacher's - Northport and Village West  
Jim's Super Value  
K-Mart - North and South side  
Piggly Wiggly - N. University  
NDSU - South Engineering  
Salvation Army - 4th St. & 1st Ave. N.

## MOORHEAD LOCATIONS

Holiday Mall lot - 24th Ave. between 8th & 10th St. S  
Brookdale Mall lot - 24th Ave. between 8th & 9th St. S  
Hornbacher's - 11th St. & 1st Ave. S  
Northside Piggly Wiggly - 210 11th St. N.  
Center Mall lot - Center Ave. & 4th St.

For more information 239-5381



**Recycle Newspapers**





**NO NEWS IS  
GOOD NEWS**

SAVE OUR LANDFILL



# THE FORUM

Fargo-Moorhead

TUESDAY, MAY 10, 1983

Second Class Postage Paid at Fargo, N.D.  
Moorhead, Minn. USPS 206-040



Newspapers fill and surround a dumpster at Messiah Lutheran Church in Fargo. (Forum Photo by Dave Wallis)

## Dumpsters runneth over with newspapers

By KEVIN MURPHY  
Staff Writer

Efforts by the cities of Fargo and Moorhead to encourage the recycling of newspapers has received, well, an overflowing response.

At times, collection dumpsters are getting more papers than can hold.

"We're doing as best we can to keep up," said John Moreland, manager of Huschke Recycling, which picks up the papers in Fargo and sells them for recycling.

There are nine dumpsters in Fargo and six in Moorhead. Huschke rents the dumpsters

from the city in Fargo. City crews in Moorhead do their own collections and sell the papers to Huschke.

Fargo and Moorhead are in the midst of an advertising campaign on newspaper recycling. Moorhead received a grant of \$16,000 from the federal Army Corps of Engineers for the ads and is including Fargo in the effort, said Emery Stordahl, building and energy coordinator at Moorhead.

Ads have been run on the radio, in newspapers and on billboards, buttons and even grocery bags.

"We're getting a big re-

sponse," Stordahl said, adding that the ads are to continue for another two months.

The Corps of Engineers is behind newspaper recycling as a rather indirect way of protecting underground water supplies, Stordahl said. Newspapers fill up dumps and dumps can contaminate water supplies, the corps say. Fewer newspapers result in smaller and fewer dumps.

And cities are happy to go along with recycling because it reduces loads on city trucks and keeps landfills more manageable.

Huschke, based in Alexandria, Minn., and operating locally out

of Moorhead, sells the newspapers to insulation manufacturers or to companies that recycle the papers into newsprint.

Newspaper collections are done Monday to Friday in Fargo and on an as-needed basis in Moorhead.

Moreland said Huschke may ask the city of Fargo to place a dumpster at the Buttrey-Oaco site on the south side and to put a second dumpster at Northport. He said Saturday pick-ups may be necessary.

"It's just a matter of gearing up to keep up with it all," Moreland said.

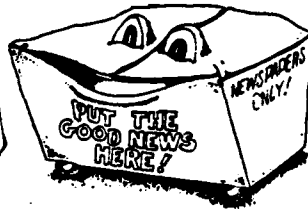
## Campaign urges newspaper recycling

The administrative offices of Moorhead, in cooperation with the administrative offices of Fargo and Audio Media Corp., have launched a spring and summer campaign encouraging newspaper recycling.

The premise of the campaign is "No News in the Landfill Is Good News for Fargo-Moorhead."

The public is asked to save newspapers, put them in grocery bags and place them in specially marked dumpsters at grocery stores, shopping centers and other locations.

For more information contact Emery Stordahl, Moorhead, 299-5301, or Susan Smith, Audio Media Corp., 237-6963.



## NO NEWS IN THE LANDFILL IS GOOD NEWS FOR FARGO-MOORHEAD!

No good newspaper news photo yet some thought has about a growing problem in the Fargo-Moorhead area.

The landfills in both cities are filling up fast faster than necessary. And new facilities would be both expensive and messy for our citizens.

But there is something you can do to help. Recycling is the single biggest waste now. Yet every newspaper and magazine is made of 100% paper products and materials. Each city government has declared it "clean up" the problem. They've set up outdoor collection centers in both cities. The rest depends on you.

We're asking you to collect your old newspapers, put them in grocery bags and drop them in specially marked, bright yellow dumpsters at these convenient Fargo-Moorhead locations.

Watch for them & please help.

### FARGO LOCATIONS

Hennepin's - Northeast and Village West  
Jen & Butler Value  
J. Allen - North and South ends  
Peggy Waggy - N. University  
NDSU - South Engineering  
Sullivan Army - 4th St. & 1st Ave. N.

### MOORHEAD LOCATIONS

Hendry Mall lot - 2nd Ave. between 6th & 10th St. S.  
Brinkhoff's Mall lot - 2nd Ave. between 6th & 8th St. S.  
Hennepin's - 11th St. & 1st Ave. S.  
Northside Peggy Waggy - 210 11th St. N.  
Center Mall lot - Center Ave. & 4th St.

For more information 299-5301



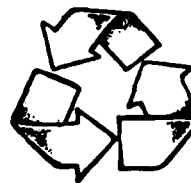
RECYCLE NEWSPAPER

180 Public Sales  
181 Antiques and Collectibles  
182 Household Goods  
183 Home Improvements  
184 Office Equipment  
185 Heating/Air Conditioning  
187 Aviation

**AUTOMOTIVE**  
188 Antique and Classic Cars  
189 Automotive Services  
190 Autos  
191 Pickups  
192 Trucks

#### 46 Public Notice

**READ IT TODAY.  
RECYCLE IT  
TOMORROW.**



**THE FORUM**  
Fargo-Moorhead

#### 47 Loans

**BOB'S PAWN** 302 N. Univ Drive. 232 2505

#### 48 Legal Services

**MICHAEL O'NEEL**, Lawyer, free first conference on any legal matter. Drop in - 322 N. 5th or call 293-8050.

**THE DEPARTMENT OF Housing and Urban Development (HUD)** is soliciting bids for an area management broker contract within the Fargo area. HUD invites all interested and experienced real estate brokers licensed in the state to request a bid package from the Denver HUD Property Sales Office. Minority and women real estate brokers are encouraged to submit bids. For further information and/or to request a bid

**FOUND:** Green tenderskirt by Eastgate Liquors in Moorhead 233-4790, keep trying

**FOUND:** Moorhead High School class ring. Found near parking lot of the Moorhead Center Mall. 233 2879

**FOUND:** Female Irish Setter near Avon, MN by freeway on the evening of Monday, December 26th. About 1 year old, wearing red collar. Call 218-354-7771

**LOST:** Black medium sized male dog with 3 white paws. Last seen 3 miles North of North Broadway bridge. Answers to the name Water. Call 236-5203 or 237-6438.

**LOST** Wednesday night a small black curly haired dog part Rat Terrier and mut. Wearing a red collar. Lost in NW Dilworth area. Answers to the name of Poochie. 236-8526

#### \$500 Reward

For information leading to the recovery of a 1984 black SRV Yamaha snowmobile stolen from Super 8 Motel (Fgo) parking lot Christmas Eve. Call 1-701-663-3425

#### 70 Help Wanted General

**WANTED** to start at once, experienced wrecker driver. 293-7663

**RESIDENT caretaker** couple for 18 or 24 plex in S. Moorhead 236-8570 after 4PM.

**EXPERIENCED Floral Designer.** Apply at West Acres Shotwell Floral.

**NEED** experienced phone solicitors. Call 233-4418 between 1 and 3.

**CAREER OPPORTUNITY!** Individuals to train for management positions, full and part time. Call 293-1512 for appointment

**WANTED:** Janitor, 4 hour per night, 5 nights a week, \$3.3 per hour, must have experience and references. Call 237-3441.

**MAKE** up to \$12 per hour Part time full time. Good working environment, telephone sales. Call 233-2672

**24-hr** "Dial-a-job" service recorded job info call, new job openings weekly

★ 237-9591 ★

WATER EMPLOYMENT SERVICE

**Health Club**



AGREEMENT

THIS AGREEMENT, Made and entered into this 21 day of March, 1983, by and between the City of Fargo, North Dakota, a Municipal Corporation, whose post office address is 201 North Fourth Street, Fargo, North Dakota, hereinafter referred to as CITY; and Daniel Huschke, doing business as Huschke Recycling, hereinafter called HUSCHKE;

WHEREAS, HUSCHKE wishes to pick up paper in the City of Fargo at pickup sites to be designated by the CITY, and,

WHEREAS, CITY, is agreeable to such an arrangement and the parties wish to commit their agreement in writing;

NOW, THEREFORE, in consideration of the foregoing premises and other valuable consideration, the parties hereto do hereby agree as follows:

1. The parties agree that containers will be placed at locations in the City of Fargo designated by the Superintendent of the Garbage Utility with HUSCHKE to be notified of the locations. HUSCHKE agrees to pick up paper deposited in such containers on a regular basis, the frequency of such pickups being such as may be necessary to ensure that the containers do not overflow and thereby become a nuisance. HUSCHKE will lease such containers from the CITY on a separate lease arrangement.

2. This agreement shall extend for one year and shall automatically expire one year from the date hereof, unless extended by negotiation and agreement at that time.

IN WITNESS WHEREOF, the parties hereto have executed this agreement the day and year first above written.

CITY OF FARGO, NORTH DAKOTA  
A Municipal Corporation

By Jan G. Lindgren  
Jan G. Lindgren, Mayor

Attest:

F. R. Fahrlander  
F. R. Fahrlander, City Auditor

DANIEL HUSCHKE, D/B/A HUSCHKE RECYCLING

By Daniel Huschke  
Daniel Huschke

AGREEMENT

Exhibit 13

This agreement made and entered into this 31st day December, 1983, by and between Huschke Recycling, licensed and bonded by the City of Moorhead, hereinafter referred to as "Operator" and the City of Moorhead a municipal corporation, hereinafter referred to as "City".

Witnesseth:

Whereas: The "City" was granted money from the Corps of Engineers to establish a newspaper recycling program to reduce the tonnage of refuse being deposited in the Clay County landfill as well as the fact it is a recyclable product thus lessening the depletion of forest products of our Nation:

Whereas: The "Operator" is operating a paper recycling business within the City of Moorhead, and furthermore has the capability to pick up, bale, and store said paper until an outlet is available, the "City" does hereby enter into this contract with the "Operator" under the following conditions:

1. The "City" shall provide specially marked containers at given locations.
2. The "City" shall charge the "Operator" at a rate of \$11.00 per container per month payable by the 10th day of the month.
3. The "Operator" shall empty said containers as often as necessary.
4. The "Operator" shall keep the area in and around the container in a neat and clean condition at all times.
5. In case the "Operator" neglects to empty the container when necessary or neglects to keep the area reasonably neat and clean the "City" after a two-day notice of the infraction shall empty the container and/or clean the area billing back to the "Operator" at a rate of \$10.00 per container per time of need.
6. This agreement shall continue in force for one year with option for renewing on the 1st day of January each year.
7. The agreement may be broken only if there is proven neglect on the part of either party.

CITY OF MOORHEAD BY

HUSCHKE RECYCLING

Morris L. Lanning  
Morris L. Lanning, Mayor

Dan Huschke  
Dan Huschke, Owner

Everett B. Lecy  
Everett B. Lecy, Dir. of Administration

POUNDS OF NEWSPRINT RECYCLED  
PER MONTH FOR 1982-83

Exhibit 14

<u>DATE</u>	<u>POUNDS</u>	
January - 82	18,780	AVERAGE MONTHLY PICK-UP 32,236 LBS., or 16.1 TONS
February - 82	23,800	
March - 82	26,080	
April - 82	33,740	
May - 82	34,760	
June - 82	45,650	
July - 82	35,930	
August - 82	38,500	
September - 82	40,540	
October - 82	40,740	
November - 82	30,920	
December - 82	31,400	
January - 83	25,040	AVERAGE MONTHLY PICKUP - 176,250 LB or 88.1 TONS
February - 83	29,600	
March - 83	29,220	
April - 83	31,080	
May - 83	146,000	
June - 83	47,400	
July - 83	204,900	
August - 83	209,100	
September - 83	202,200	
October - 83	204,200	
November - 83	196,800	
December - 83	199,400	
January - 84	84,900	AVERAGE 86,533 LBS or 43.3 TONS
February - 84	80,600	
March - 84	94,100	

## FIRST PLACE

19  83

### TWENTY-SEVENTH ANNUAL F-M ADVERTISING FEDERATION ADDY AWARD COMPETITION

**Advertiser:** Cities of Fargo & Moorhead

**Category:** Save Our Landfill  
Newspaper

**Creative Credits:** Spider Johnk  
Sue Smith

*Ranae M. Oxtan*

Ranae M. Oxtan  
Advertising Federation President

## MERIT AWARD

19  83

### TWENTY-SEVENTH ANNUAL F-M ADVERTISING FEDERATION ADDY AWARD COMPETITION

**Advertiser:** Cities of Fargo and Moorhead

**Category:** Save Our Landfill  
Complete Campaign

**Creative Credits:** Spider Johnk  
Susan Smith  
Lee Massey

*Ranae M. Oxtan*  
Ranae M. Oxtan  
Advertising Federation President

**FARGO-MOORHEAD URBAN STUDY**

**THERMOGRAPHY**

11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 10

## TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
THERMOGRAPHY	1
Introduction	1
Aerial Versus Ground-Level Topography	3
Contractor Selection	5
Local Interest	7
Publicity Campaign	8
Information Centers	12
Volunteers	14
Handout Selection	16
Post-Program Notes	19
Conclusions	24

## LIST OF FIGURES

<u>No.</u>	<u>Title</u>	<u>Page</u>
1	Communities and Developments Included in Thermography Survey	2
2	Press Release on Thermography Surveys	11

## LIST OF EXHIBITS

<u>No.</u>	<u>Title</u>	<u>Page</u>
1	Fargo-Moorhead Urban Study: Thermographic Survey Scope of Work	27



217 228 239 250 261 272 283 294 305 316 327 338 349 360 371 382 393 404 415 426 437 448 459 470 481 492 503 514 525 536 547 558 569 580 591 602 613 624 635 646 657 668 679 690 701 712 723 734 745 756 767 778 789 800 811 822 833 844 855 866 877 888 899 910 921 932 943 954 965 976 987 998

## THERMOGRAPHY

### INTRODUCTION

Thermography is infrared photography that shows relative amounts of infrared radiation (heat) emitted and reflected by objects, much as normal photography shows relative amounts of visible light emitted or reflected.

Thermography is a popular tool for discerning energy (specifically heat) losses. Thermographic imagery shows bright ("hot") areas with greater heat losses and ("cool") areas with lesser heat losses. Because such visual imagery is relatively easy to understand and because many people find it interesting, thermography provides a captivating, instructive means to establish broader in-depth discussions of energy conservation topics.

The St. Paul District felt that sponsorship of a residential thermographic survey would be an excellent means of meeting the Chief of Engineers goal of developing Corps leadership in energy conservation. The survey was carried out as a part of the Fargo-Moorhead urban study.

Ground-level thermography was conducted on over 1,600 residences in the 16 smaller communities and developments in the study area listed below (figure 1):

#### North Dakota

Argusville

Briarwood

Brooktree Park

Frontier

Harwood

Horace

Mapleton

North River

Prairie Rose

Reile's Acres

Rivertree Park

#### Minnesota

Dilworth

Glyndon

Kragnes

Rustad

Sabin

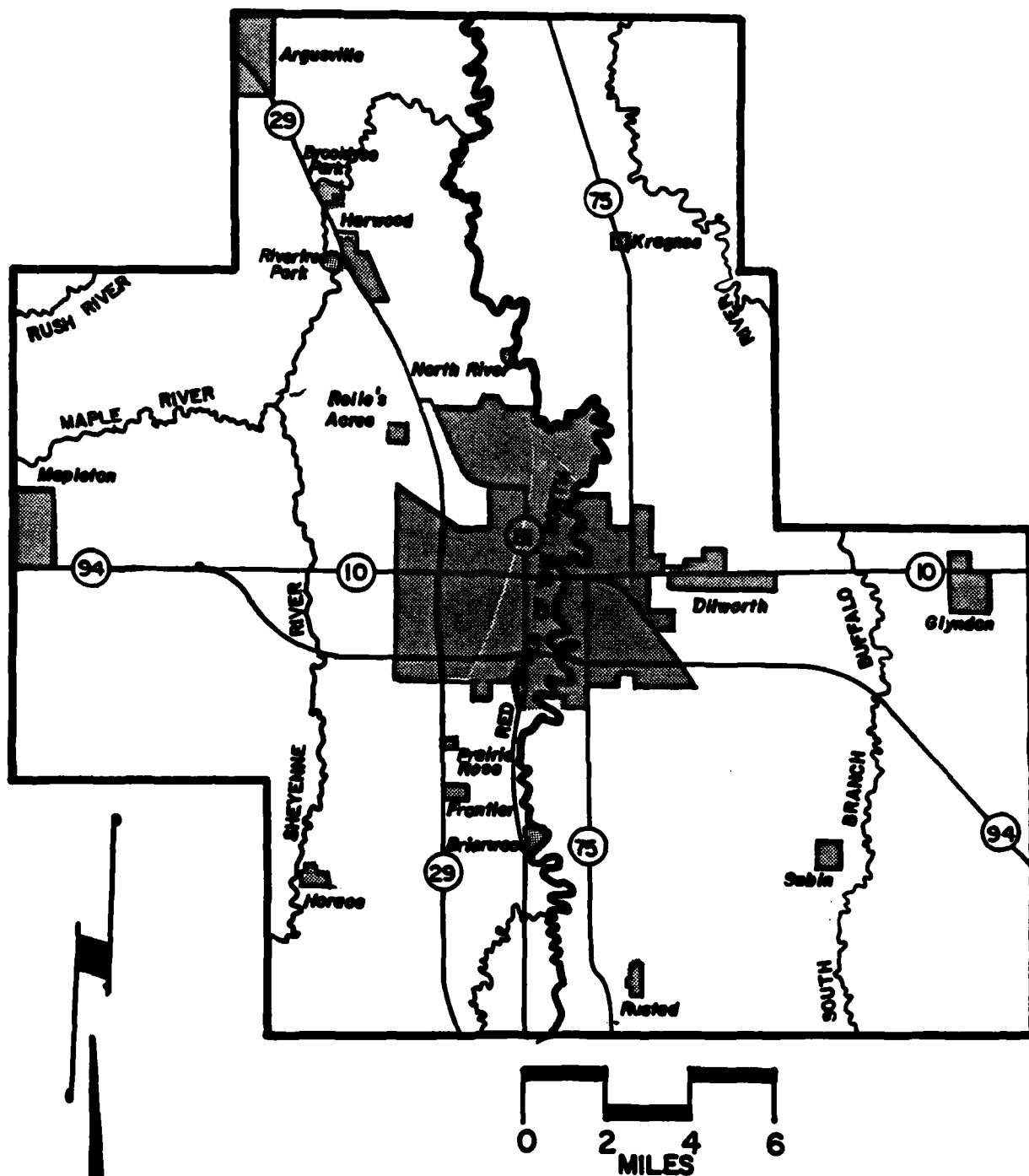


Figure 1 - Communities and Developments Included in Thermography Survey

In recent years, other sponsors had conducted aerial thermography for the larger municipalities (Fargo and Moorhead) and for some nearby communities (notably West Fargo and Riverside). The urban study's focus on the smaller outlying communities in the study area was a welcome surprise for many of these communities' leaders and citizens who generally see the large cities absorbing most of the attention in any Federal program.

The videotaped ground-level thermographic images were available for public viewing at six community information centers. Volunteers from the study area were trained to operate videotaped playback equipment and to interpret the thermograms for residents visiting the centers.

This report covers all aspects of the thermography survey with the goal of emphasizing lessons learned that might benefit future efforts by the Corps or by higher agencies.

#### AERIAL VERSUS GROUND-LEVEL THERMOGRAPHY

The St. Paul District selected ground-level thermography over aerial thermography for the Fargo-Moorhead Urban Study for a number of reasons. In the past, aerial thermography would have been used for the scale of effort considered for the urban study. The St. Paul District, for example, used aerial thermography in the Grand Forks-East Grand Forks Urban Study (completed just as the Fargo-Moorhead Urban Study was beginning). Key disadvantages of aerial thermography surfaced, however, as the thermography proposal moved from concept to reality.

The St. Paul District reviewed current literature and discussed the proposed program with the Minnesota Energy Agency (MEA), North Dakota State Energy Office (NDSEO), NDSEO's local representatives at the North Dakota State University Cooperative Extension Service, Fargo-Moorhead Metropolitan Council of Governments (MCOG), and seven thermography and aerial photography contractors. Information from these contacts

established a data base for comparing the relative merits of aerial and ground-level thermography. This information was also important for the development of a technically sound scope of work for the proposed thermography (exhibit 1).

Aerial thermography (thermograms taken from aircraft flying over the subject community) produces imagery of rooftops and shows apparent heat losses through the attic. However, many homeowners have difficulty relating to aerial photographs. This difficulty is aggravated because the thermographic image of each house on the photograph is only a fraction of an inch (often about 1/4 inch) long. Furthermore, the relationship between the amount of attic insulation and aerial thermographic imagery is inconsistent. Madding's Thermographic Instruments and Systems (1979) says: "Airborn termal scanning is not (yet) a viable tool to determine attic insulation R-values. . . . The real advantage of airborne thermography is residential heat loss studies is getting people's attention. . . . it's an excellent departure point for a discussion of energy conservation throughout the home."

Ground level ("drive-by") thermography produces eye-level images of residences that homeowners can easily recognize. (Homeowners in the Fargo-Moorhead area often helped "find" their own house on the videotaped imagery by recognizing neighbors' houses.) The images clearly reveal serious heat-loss problems around the perimeter of the home. (Many thermographically-suggested problems were verified by homeowners who visited the information centers to confirm suspected problems.) Therefore, the attention-getting benefits of ground-level thermography are the same as or better than those of aerial thermography, plus it provides meaningful energy-loss information -- insulation voids, air leaks, window heat loss, and other problems.

It should be noted that ground-level thermography does not lend itself to conclusions regarding the adequacy of attic insulaton. However, the position of the Minnesota Energy Agency and most current literature is

that aerial thermography does not either. Thus, the St. Paul District felt that reliability was not lost by using ground-level thermography. Indeed, recommended amounts of attic insulation are widely publicized and it is relatively easy for a homeowner to check his or her own attic insulation. Other possible heat-loss problems (such as missing, inadequate, or settled exterior wall insulation) are not so easy to detect. Because ground-level thermography can reveal many of these latter problems, it provides useful information that homeowners can immediately translate into energy-saving improvements.

The St. Paul District also determined that the costs of ground-level thermography were less than those for aerial thermography. The costs for using drive-by thermography, training volunteer thermogram interpreters, and setting up information centers was less than \$10,000. By comparison aerial thermography would have cost over \$12,000 for the thermographic fly-overs alone. Also, ground-level thermography is less susceptible to costly weather-related delays than is aerial thermography.

#### CONTRACTOR SELECTION

The first step in selecting a contractor was to conduct a preliminary screening of prospective contractors based on respective experience, initiation and completion dates, approximate costs, output formats, and other factors. The St. Paul District then sent requests for proposal to firms with either aerial or ground-level thermography capability that were able to meet the urban study's timetable. Although ground-level thermography offered more useful output, the primary objectives of the urban study's thermography program -- to make homeowners conscious of energy conservation and to expose them to home energy savings in broad terms -- could have been met adequately by aerial thermography. Quantitative assessments of energy losses were not needed to make the program succeed. Qualitative thermography was appropriate and could be

achieved by either aerial or ground-level thermography. Furthermore, cost was an important element: if aerial thermography had been significantly cheaper, it could justifiably have been selected.

Energy Conservation Consultants, Incorporated (ECC), of Bloomington, Minnesota, was selected because it proposed to conduct ground-level thermography for less than \$10,000, compared to proposals ranging upwards from \$12,000 for aerial thermography. A key factor that made ground-level thermography cost-competitive was the requirement that only the street-side of each house be thermographed. This specification substantially reduced costs below those for a survey of the entire perimeter of each house.

The St. Paul District felt that heat-loss problems on the street-side of a home would be representative of problems on all sides. It also felt that street-side thermography would achieve the major purposes of the urban study's thermography program, i.e., effectively directing homeowners' attention to all aspects of home energy savings. Furthermore, all thermographs would be taken from the street, thereby avoiding potential questions of trespassing and the impracticabilities of soliciting house-by-house permission. The latter would also have required equipment operators to sort out -- at night and in unfamiliar towns with few or no street addresses -- those homes with and without permission.

The contractor's field crew comprised a technician to operate the thermography equipment and a locally-hired driver to minimize the incidence of missed residences. To improve the field crew's navigation, each community was asked to provide a street map. A post-program check suggested that the survey missed six houses and a trailer park.

A mixture of house identifications (addresses, owner's names, and descriptions) was used because in several communities street names and/or home numbers were not apparent to the field crew. Addresses were

available for about 58 percent of the houses, and owner's names could be found 6 percent. Descriptions -- some as brief as "white house south of bar" -- were used for nearly 36 percent (575 houses).

A one-time number system was considered. This system would have had homeowners display a preselected number for the field crew to record. But the logistics were too uncertain -- particularly getting homeowners' cooperation and timely participation when weather vagaries made it impossible to firmly schedule dates for thermographing each community. Also, homeowners visiting the information center a month or more after the thermographing might forget their numbers, and future owners would have no idea how their house had been identified. These problems are overcome if addresses are available, but some problems remain where owner's names or house descriptions are used because owners, colors, and identifying landmarks will change.

#### LOCAL INTEREST

The St. Paul District contacted local spokesperson to determine the extent of local support and interest in participation in the thermography program. These spokespersons included mayors (or council members where mayors were not available) representing twelve incorporated communities and township chairpersons representing four unincorporated developments.

St. Paul District representatives told the local spokesperson that the proposed thermography program would be conducted at no cost or obligation to the individual communities. The spokespersons were also told that, after the thermography was completed, the Corps would help set up one or more information centers staffed by local volunteers trained to present and interpret the results to homeowners.



Fifteen spokespersons expressed unreserved interest and pledged their support. One township chairman felt he lacked authority to grant permission; however, township resident's expressions of interest in response to thermography publicity convinced him to later request that his constituents also be included.

The publicity campaign also promoted interest in other communities -- notably Moorhead and West Fargo. Although these cities already had been surveyed by aerial thermography, the advantages of ground-level thermography prompted city representatives to request that they be included in the urban study's thermography program. Unfortunately, budget and time constraints prevented the St. Paul District from including cities of their size, even on a partial basis. However, representatives of these two cities expressed a desire to participate any future program.

The Fargo-Moorhead MCOG's Policy Board expressed early reservations about the proposed thermography program. The Board's initial lack of support was because of the relatively poor public response to the aerial thermography previously done for the bigger cities and because of misunderstandings about the scope of work. Many board members, however, supported the program's objectives after the scope was clarified and after the advantages of using ground-level, rather than aerial thermography were explained.

#### PUBLICITY CAMPAIGN

On March 9, 1982, one week before the start of survey field operations, the St. Paul District launched an intensive publicity campaign. The Corps project manager met with representatives of the following local media:

Television:      KTHI-TV (channel 11)  
                    KXJB-TV (channel 4)

WDAY-TV (channel 6)  
Radio: KCCM (Public Radio)  
KFGO  
Newspaper: Fargo Forum

Each medium was granted an individual interview, was given a map of the urban study area identifying the communities involved plus a 30-second "public service announcement," and was shown photographs of thermographic equipment and imagery. The Corps project manager explained the overall scope of the urban study and the Corps interest in helping to meet the Nation's energy conservation challenge by assisting area homeowners in identifying heat-loss problems. The project manager described thermography and the differences between the aerial thermography done for the bigger cities and the ground-level thermography to be used for the outlying communities. It was also pointed out that the MEA, NDSEO, and St. Paul District believed that the urban study's ground-level thermography survey would be the largest of its type in the country. The project manager noted that the surveys had to be conducted at night to avoid misreadings from walls and attics retaining the sun's heat. Also, the surveys had to be completed before warm weather because reliable results required at least a 20° Fahrenheit difference between indoor and outdoor temperatures. The equipment would be housed in a station wagon with "Infrared Survey" signs on the sides and a rotating amber beacon. This vehicle would briefly stop in front of each house and record the thermographic image of the street-side of the house on videotape. The videotaped results would be available for viewing by homeowners in a few weeks at information centers set up with the help of State agencies and local officials. Volunteers would be trained at Corps expense to help visiting homeowners interpret the thermograms.

The Fargo Forum published its article on the urban study's thermography program in the March 21, 1982, Sunday edition. This edition also presented other energy-saving articles, notably one describing the

Northern States Power Company home energy audit program. The Fargo Forum also included a brief notice soliciting volunteers for the information centers.

The thermographic surveys began in Argusville on the evening of March 16, 1982. One of the television stations recorded the 2-man Energy Conservation Consultants, Incorporated (ECC), crew simulating the videotaping of several house thermograms. The television station reporter interviewed the President of ECC, the Corps project manager and a local homeowner. The ECC crew gave the reporter the videotape of the simulated thermograms for use in a telecast. A second television station covered the second night of surveys and interviewed the ECC crew chief. This station also received a videotape of simulated thermograms. This on-the-spot coverage of the thermography survey crew was very effective in promoting public interest. Many residents stayed up late to watch the crew survey their towns. Also, the publicity probably prevented many instances of uninformed people confronting the crew or calling the police to report a suspicious vehicle scouting the neighborhood.

The combined television, radio, and newspaper coverage generated much interest in the thermography program and attracted several volunteers. One television station even covered the volunteer training session held at the North Dakota State University on March 27, 1982.

After determining the locations, dates, and times of the information centers, the St. Paul District telephone local newspapers and community representatives. On April 5, 1982, about one week before the first information center opened, the Corps sent a press release (figure 2) to the Fargo Forum, Cass County Reporter, Mid-Weed Eagle, and representatives of all 16 communities. The press release was suitable for publishing in the newspapers and for posting in prominent areas, such as post offices and supermarkets.

Figure 2  
Press Release on Thermography Surveys

**HEAT LOSS SURVEYS**

Unhappy with your winter heating bills? Then read on!

The St. Paul District, Corps of Engineers, recently sponsored ground-level thermographic (heat loss) surveys of homes in the following communities:

- |                       |                        |
|-----------------------|------------------------|
| 1. Argusville, ND     | 9. Kragnes, MN         |
| 2. Briarwood, ND      | 10. Mapleton, ND       |
| 3. Brooktree Park, ND | 11. North River, ND    |
| 4. Dilworth, MN       | 12. Prairie Rose, ND   |
| 5. Frontier, ND       | 13. Reile's Acres, ND  |
| 6. Glyndon, MN        | 14. Rivertree Park, ND |
| 7. Harwood, ND        | 15. Rustad, MN         |
| 8. Horace, ND         | 16. Sabin, MN          |

These surveys are part of the Fargo-Moorhead Urban Study, which is looking at other problems and concerns as well, including water supply and flood control.

The heat loss surveys were made using \$35,000 of thermographic equipment to videotape the infrared image of each home's street-facing side. The black and white image reveals warm (high heat loss) areas in light tones and cool (low heat loss) areas in dark tones. Insulation voids in walls, doors and windows lacking adequate weatherstripping, and other energy wasters show up dramatically.

The results of the thermographic surveys are available to interested homeowners at the following information centers:

<u>Date</u>	<u>Time</u>	<u>Place</u>	<u>Communities</u>
April 12-17	Noon to 9 p.m.	Harwood Legion	1, 3, 7, 11, 13, 14
April 19-20	1:30 to 9 p.m.	Mapleton City Hall	10
April 21	5 to 9 p.m.	Horace Fire Hall	2, 5, 8, 10, 12
April 22-24	Noon to 9 p.m.		
April 26	1 to 3 p.m.	Glyndon Community Center	6, 9
April 27	3 to 9 p.m.		
April 28	Noon to 3 p.m.		
and	6 to 9 p.m.		
April 29-30	Noon to 9 p.m.	Sabin Community Center	15, 16
May 1	Noon to 9 p.m.	Dilworth City Hall	4, 6, 9, 15, 16
May 3-8	Noon to 9 p.m.		
May 10	Noon to 6 p.m.		
May 11	Noon to 9 p.m.		

Homeowners visiting these centers will be helped by volunteers from several communities and organizations who attended a training session on March 27 to learn how to interpret the infrared images. Several publications which describe ways to save energy around the house will be available to homeowners.

The last major media event took place on April 12, 1982, the opening night at the first information center, located at the Harwood Legion. Two television stations sent crews who interviewed the Mayor of Harwood, the Corps spokesperson, and some of the first homeowners to visit the center. These first homeowners were highly motivated, energy conscious, and fairly conversant about energy-saving measures; they made excellent subjects for the interviews.

The excellent publicity generated to this stage by certain elements of the media was undoubtedly a key factor in generating the initial high level of homeowner visitation at the information centers. The early momentum of homeowner enthusiasm and awareness of the information center's movements was expected to be adequate to carry over the next few weeks. However, homeowner turnout declined with time, and the primary reason was felt to be a lack of occasional media reminders to the public as the information center moved from community to community.

#### INFORMATION CENTERS

After considering various options, the St. Paul District determined the number of information centers and their locations. Because local officials were responsible for furnishing facilities, however, their advise was a major factor in scheduling dates and sites.

Several local officials requested that an information center be set up in their communities for the convenience of homeowners. In response to these requests, the St. Paul District increased the number of locations. However, some communities were too small to warrant a separate information center. Kragne and Rustad, for instance, had only 9 and 12 houses thermographed, respectively. The final plan had six information center locations, each serving one to six communities. The length of time and information center remained at a given location was determined by the number of houses thermographed and communities served.

The original information center concept assumed two shifts: noon to 5 p.m. and 5 p.m. to 9 p.m., Monday through Saturday. Each shift ideally would have had two volunteers to alternate as thermogram interpretation and energy conservation material distributor. In addition, a substitute would have been designated in case illness or other problems prevented one or both scheduled volunteers from showing up.

This concept had to be modified because of the limited number of volunteers and hours of their availability. Most shifts had only one volunteer and no substitute, and approximately half the information center dates required schedule changes to accommodate volunteers hours. The resulting irregular schedule made it more difficult for potential visitors to know what the information center hours were. The Corps provided the news media with a list of the locations and hours (figure 2); however, because the information center was "on the road" for a month, many homeowners probably lost track of the locations and hours. Follow-up notices might have reminded and re-enthused homeowners during the latter part of the schedule.

The St. Paul District furnished the information center with locally rented playback equipment: a 19-inch black and white television, videocassette player, and power pack. The equipment rented was identical to that used by the thermography contractor. Therefore, at the volunteer training session, identical sets of equipment were available for demonstration and "hand-on" practice. Furthermore, the contractor was totally familiar with the equipment and could prepare a manual for the volunteers that detailed setup, disassembly, and operation of the videotape playback equipment.

The equipment was transported from one information center location to the next and eventually back to the rental firm by personnel from the Cass County and Clay County Extension Offices. Close coordination was needed to ensure that the timing of pickups and deliveries coincided with scheduled open hours at the facilities used as information centers.

The manual that the contractor prepared for the volunteers catalogued each of the 1,622 houses thermogrammed by address, owner's name, or description and the location of its thermogram on one of seven videotapes. The tape location could be found by "zeroing" the counter on the videotape player before starting the tape, then fast-forwarding to the specified point.

This system worked reasonably well, although some volunteers noted difficulty locating a specific thermogram. Several factors might have contributed to these difficulties. Some volunteers probably failed to rewind the videotapes after use; the next time these tapes were used, the counter's "zero" could be off by several hundred. Other factors could have been tape stretch and/or erratic counter problems, the homeowners could often identify the thermograms of neighbors' houses and thereby zero in on his or her own house. In cases where the counter was far off, the volunteer would fast forward or reverse the tape until the homeowner recognized neighborhood houses and homed in on his own house from that point.

#### VOLUNTEERS

The volunteer interpreters were a key factor in the success of the thermography program. These people represented a cross section of concerned and involved citizens in the study area: men, women, retirees, housewives, students, community leaders and employees, and others.

Volunteers donated several houses to training and their shifts, and they provided their own transportation. Their responsibilities were great -- setting up and securing the equipment, interpreting the thermograms with homeowners to identify significant heat-loss problems, and providing meaningful suggestions coupled with appropriate energy conservation handouts. The rewards were equally satisfying -- helping neighbors, learning and applying a new skill, examining their own home's thermogram

from a more knowledgeable perspective, and contributing suggestions to improve future programs.

Several methods were used to solicit volunteers: a newspaper notice in the Fargo Forum; telephone requests to local officials, organizations, and schools; and indirect referrals to individuals and other civic-minded groups. The most critical problem in recruiting volunteers was the short (9 days) notice from the time recruitment started until the date of the interpreter training session.

A Saturday training session was selected to enable people working during the week to attend. Calendar conflicts precluded April dates. Therefore, a late March date was selected to avoid pushing the program into the May-June timeframe when concerns about winter cold and heat losses would lose their immediacy and when local attention would turn to warm weather activities and spring planting. Unfortunately, the late March date provided only 9 days notice and resulted in a frenzied and high-pressure recruiting effort.

The newspaper notice generated three volunteers -- all from communities not covered by the thermography program. Several communities were able to identify one or more individuals willing to help. Because of the thermography program's educational value, the Dilworth High School offered juniors and seniors a 1-day credit for participating. Several students took part. The Moorhead Area Vocational Technical Institute Director identified two potential volunteers. People Involved in North Dakota (PIND) generated active assistance. Community fire department personnel also contributed generously of their time and effort.

Twenty-nine candidate volunteers attended the 3-hour training session at the North Dakota State University Agricultural Engineering Building on March 27, 1982. The contractor used his own and Corps-rented videotape playback equipment to demonstrate how to set up and take down the equipment, locate a specific thermogram on the tape, and "read" heat-loss



problems from the thermogram. The volunteers were given the opportunity to get "hands on" experience assembling and dismantling the equipment and simulating finding and discussing a specific thermogram. Several volunteers requested that "cookbook" instructions for equipment operation be developed. The contractor added this material to the catalog of thermographed houses in time for the information center's grand opening.

A "calendar" of information center shifts was displayed to encourage the volunteers to reserve shifts convenient to their schedules. Shift hours were adjusted to fit volunteer availability in 8 of 52 shifts; 3 shifts were cancelled. Although 22 of the candidates volunteered for over 80 percent of the 52 shifts, about two-thirds of the shifts were covered by only a single volunteer, which provided no breaks and no back-up in case of illness.

The only open shifts left were for the Dilworth information center. Eight Dilworth civic leaders and citizens volunteered later and helped to plug these gaps. Their lack of training had an unknown impact on their ability to handle the equipment and interpret the thermograms.

#### HANDOUT SELECTION

The primary objective of the thermography program was to foster awareness of the full extent of home energy conservation concerns and possible improvements -- not to restrict homeowners' attention to heat-loss problems revealed by the thermograms. The St. Paul District worked together with the MEA and North Dakota State University's Cooperative Extension Service to assemble a comprehensive selection of up-to-date home energy conservation pamphlets, brochures, booklets, do-it-yourself ideas, and other information. These materials were made available to homeowners visiting the information centers to view their homes' thermograms.

The MEA furnished seven brochures plus a post card with a toll-free telephone number for answers on energy conservation<sup>(1)</sup>:

- o Conservation Guide 1 - Home Energy Audit
- o Conservation Guide 2 - Weatherstripping and Caulking
- o Conservation Guide 3 - Ceiling Reinsulation
- o Conservation Guide 4 - Windows and Doors
- o Conservation Guide 7 - Window Coverings
- o Conservation Guide (unnumbered) - Water Heating
- o Conservation Guide (unnumbered) - Cooling Your Home

The Cooperative Extension Service provided the following information:

o "How to Get the Most Back for the Least \$pent - Economic Weatherization of Your Home," a pamphlet describing basic, low-cost energy-saving tips that most homeowners could readily adopt.<sup>(2)</sup>

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(1) All seven brochures and the post card are available from:

Energy Division  
Minnesota Department of Energy, Planning, and Development  
Energy Information Center  
980 American Center Building  
150 East Kellogg Boulevard  
St. Paul, Minnesota 55101

Telephone in Minnesota/St. Paul area: (612) 296-5175.

Toll-free telephone for the rest of Minnesota: 1-800-652-9747.

(2) Available in North Dakota from the local county extension office.

Out-of-State inquires should be directed to:

Bulletin Room  
Morrill Hall, North Dakota State University  
Fargo, North Dakota 58105

o "The Energy-Efficient Construction Manual: A Handbook for Builders and Developers," with computational aids and other information permitting the reader to assess energy conservation measures for construction or retrofit.<sup>(1)</sup>

o "The North Dakota Energy Savings Calculation - FueloMizer," a "slide rule" device for estimating costs and annual savings for various energy conservation improvements.<sup>(2)</sup>

The St. Paul District ordered 500 copies of "In the Bank . . . Or Up the Chimney? A Dollars and Cents Guide to Energy-Saving Home Improvements," from the U.S. Department of Housing and Urban Development. This booklet provides easy-to-follow steps for deciding which energy conservation improvements would be cost-effective and whether the homeowner or a contractor should do the job.<sup>(3)</sup>

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(1) Available in North Dakota from the local county extension office. Out-of-State inquires should be directed to:

Bulletin Room  
Morrill Hall, North Dakota State University  
Fargo, North Dakota 58105

(2) Available from: North Dakota State Energy Office  
Capitol Building  
Bismarck, North Dakota 58501

(3) Available from: HUD USER  
P.O. Box 280  
Germantown, Maryland 20874

## POST PROGRAM NOTES

The videotapes containing the thermograms of all 1,622 houses have been stored by the NDSU's Cooperative Extension Service. The videotapes may be borrowed by the communities or viewed at HDSU's facilities by individual homeowners.

The thermography videotapes were displayed at the West Acres (Shopping Mall) Energy Fair held on September 30 to October 2, 1982. Homeowners from thermographed communities were shown their residences' thermograms by Cooperative Extension Service personnel. Homeowners from other communities were shown a number of thermograms to illustrate typical types of heat-loss problems of which they should be conscious.

As part of the post-program assessment, the volunteer interpreters were contacted and asked what aspects of the program worked well and poorly and what suggestions they could offer for improvements. Suggestions from the volunteers and comments from involved Corps personnel are noted below:

<u>Aspect</u>	<u>Suggestions</u>	<u>Comment</u>
Field operations	o Have each community furnish a civic leader, city clerk, or knowledgeable citizen who could act as or assist the driver to better ensure against missing houses and to provide a correct and complete list of addresses or owners names for unmarked houses.	o This is an excellent suggestion. It would require a flexible schedule from the local individuals to accommodate weather delays, all-night drives, etc.

o In some cases, the street side of the house was largely obscured by trees, shrubs, the porch, and/or piles of snow. Information provided by thermograms of these houses was reduced correspondingly, disappointing the homeowners. Several volunteers suggested the houses be thermographed from more angles.

Volunteer  
training

o More time should be spent on thermogram interpretation and less on theory and how the equipment operates. Some volunteer had difficulty understanding and explaining the thermograms as well as they and the homeowners wished.

o Go beyond the mere identification of heat-loss problems to discuss why. Many homeowners wanted to know why heat was escaping so that they could correct the

o This suggestion would help and could be implemented, but shooting additional sides of the house would increase program time and costs several-fold. The cost per house (about \$6 for the urban study's program, excluding Corps management expenses, and information center facility costs absorbed locally) would more than quadruple. Also questions related to trespass and permission to enter private property would arise.

o The Corps agrees. At the interpretation training session, Corps and contractor personnel were prepared to remain as long as needed to coach the volunteers. However, many volunteers left without getting personal practice with the equipment and interpretations.

o This suggestion raises a basic question about the goal of the program. Should be stop at the point where we make the homeowner conscious of energy conservation in general and aware of some of his heat-loss problems in particular?

problems. Many volunteers were unable to answer these questions.

Should the volunteers be trained to an extent where they could provide specific advice regarding remedial measures? Such advice was not the original intention of the urban study's thermography program. But the volunteers' and homeowners' hunger for such follow-up suggests that the original goal might have been to modest.

Information center o The information center should be held during cold weather.

o The information center for the urban study's program ran from April 12 to May 11. Several volunteers felt the spring-like weather hurt attendance. Homeowners' concerns with heat losses and energy conservation peak during cold weather. By mid-April, people turn their attention to warm weather plans and activities. Future programs should schedule the information center no later than March.

o The information center should be identified with a larger sign posted outside the building. This sign would make it easier for homeowners to find the center and would attract the attention of passers-by who might not have

o The Corps concurs.

otherwise known about the program.

- o Develop a better indexing system to locate specific thermograms on the videotape.

- o Several volunteers had problems accurately locating homeowners' houses using the contractor's counter values. Many problems probably were caused when volunteers did not rewind the videotapes before and/or after use, rendering the counter readings meaningless. The "cookbook" manual should emphasize the need to rewind the tape and zero the counter before trying to locate a specific thermogram.

- o Make sure the equipment gives good, clear pictures in the "pause" mode, or thermograph each house longer to give an uninterrupted picture.

- o Each house was "shot" for about 10 to 15 seconds. This was sufficient time for the technician to pan across the street side of the house and zoom in as needed. The volunteer was expected to "pause" or "freeze-frame" the picture at one or more points to allow time to discuss heat-loss problems. Unfortunately, the "pause" mode on the rented equipment tended to produce a fuzzy jumpy picture or one with "noise bars." The equipment should be fine-tuned to eliminate these problems or longer shots should be taken so that the "pause" need not be used.

o Some homeowners had difficulty accepting information provided by the high school student volunteers. These homeowners would feel more comfortable dealing with older volunteers.

o Keep better track of the number of homeowners who visit the information center.

o Apparently, the credibility of these young adults was less than that of older volunteers. It was impossible to determine if this perceived problem was based on an actual inability of the students to properly explain the thermograms or if the problem was with the homeowners' inability to bridge the generation gap. Nor was it possible to determine if this problem was universal among the students or limited to one or more less articulate students.

o The manuals at the information center included sheets to record the number of visitors, but their use was sporadic and the results unreliable. Formalizing the system -- perhaps having the volunteers record the homeowners' names, addresses, and telephone numbers -- might encourage a more conscientious effort from volunteers. In addition, the program could be followed up with a homeowner survey to solicit suggestions for improving the program and to determine how many homeowners made energy-saving improvements. This idea could be structured further by asking the visitor to fill out a brief questionnaire on their houses,



how they heard about the program, whether they would mind a follow-up survey, etc.

Publicity    o More publicity regarding the information centers if needed.

o The publicity preceding and at the beginning of the field operations was considered excellent. However, the length of time between the latter (March 16) and the information center openings and closing dates (April 12 and May 11, respectively) was enough for many residents to forget, or lose track of the program and the information center. The news release that preceded the opening of the information center apparently had little impact. Several alternatives should be employed: continued public service announcements on television, radio, and in the newspapers; posting notices in supermarkets, gas stations, city halls, etc.; and notices inserted with water and/or electric bills or sent home with school children.

#### CONCLUSIONS

The goals of the thermography program were achieved. Although ultimate fulfillment would mean reaching 100 percent of the homeowners, past programs have never done so. In fact, the turnout of the urban study's program was comparable to or greater than most such programs.

Volunteers felt that the visitation at the information center was generally good, with estimates for the 16 communities ranging from 10 to

80 percent of the homeowners. Word of mouth played an important role in determining the turnout. In one community where the first few visitors were impressed, turnout was excellent because many neighbors and relatives were encouraged to attend. Conversely, in another community where the early visitors were disappointed, the turnout was equally disappointing.

Most visitors seemed to gain valuable information from the imagery and discussions with the interpreters. Visitors were often shocked to see the amount of apparent heat loss, and many expressed the intention to take steps to correct the problems revealed by the thermograms. Some visitors looked at the imagery merely to satisfy their curiosity, but even they left the information center more aware of their personal stake in energy conservation.

In addition to and, in some cases, correlating with the suggestions offered by the volunteers, other lessons which were learned from the program included:

- o Begin soliciting volunteers well before they are actually needed. Many agencies, civic organizations, schools, businesses, and other sources are willing to help but cannot do so without a long lead time.

- o Coordinate with local utility companies. They often have energy conservation programs aimed at consumers (e.g., energy audits) and could be of great assistance.

- o Display hard copy "good" and "bad" thermograms at the information center to help visitors understand what to look for when they examine their own house and what steps might be taken to correct heat-loss problems.

- o Display the Corps address plus the project managers name and telephone number for visitors to contact with questions or to get more information.

Exhibit 1

FARGO-MOORHEAD  
URBAN STUDY

THERMOGRAPHIC SURVEY  
SCOPE OF WORK

1. INTRODUCTION

Speaking before the Subcommittee on Energy and Water Development of the Senate Committee on Appropriations on 21 February 1980, Chief of Engineers Lt. Gen. John W. Morris said: "I believe we are going to see the conservation ethic dominate public policy in the eighties, as strongly as the environmental ethic dominated the seventies. . . . To solve our problems will demand that we develop innovative new techniques. . . . I hope to see the Corps of Engineers as a leader in this endeavor."

In the spirit of the Chief of Engineer's expressions, energy conservation was added to the urban study, and thermography was selected as a primary component. Thermograms are popular tools for discerning energy (specifically, heat) waste. The visual imagery of thermograms is something nontechnical laypersons can relate to. Thermograms provide a captivating, instructive step toward a broader, in-depth discussion of energy conservation matters by persons trained in thermogram interpretation.

In the Fargo-Moorhead study area, aerial thermography has already been done for Fargo, Moorhead, and West Fargo/Riverside in recent years. Therefore, this scope of work focuses on the other communities and unincorporated developments in the study area whose leaders have expressed interest in a thermography survey.

This scope of work requires the contractor to provide thermograms for most or all of the communities listed below (any exclusions to be decided jointly with each community's officials) and to conduct a training seminar for prospective interpreters.

North Dakota

Argusville  
Briarwood  
Brooktree Park  
Frontier  
Harwood  
Horace  
Mapleton  
North River  
Prairie Rose  
Reile's Acres  
Rivertree Park

Minnesota

Dilworth  
Glyndon  
Kragnes  
Rustad  
Sabin

## 2. COORDINATION AND STUDY MANAGEMENT

The Contractor will designate one individual to be project manager who will work with the Contracting Officer, the Contracting Officer's Authorized Representative, or their designees on items of overall contract management. Coordination regarding contracted activities (see section 4) may be handled by direct contact between members of the Contractor's and Government's work teams.

Coordination will generally be conducted by telephone. However, the Contractor will meet with Government representatives twice:

- o Before the thermographic survey to ensure mutual understanding of the work tasks.

- o After the survey to discuss the results and the steps to prepare for public dissemination of the results.

These meetings will take place either at the Contractor's place of business or at the St. Paul District offices. The Government will determine the time and place for these meetings.

## 3. DELIVERABLES

All materials produced in conjunction with this contract -- in particular, the thermograms, report, and related materials -- shall become the property of the Government.

## 4. OUTLINE OF WORK ELEMENTS

The following paragraphs provide a general description of the work needed for the thermographic surveys. Either aerial or ground-level thermography may be used. The Contractor will use his professional judgment and experience in conjunction with the applicable thermography survey standards of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

The quality of the thermograms shall be such that:

- o The structure can be recognized by the owner.

- o Interpreters can make a qualitative assessment of heat loss problems -- location, relative severity, and probable cause. (Quantitative results, e.g., relative R-values, specific temperatures, etc., are not required.)

The Contractor shall help the Government and local interests devise a survey publicity campaign. This campaign will explain the thermography survey goals, how the survey will be conducted, and postsurvey information dissemination plans.

The Contractor shall conduct a 1-day thermogram interpretation training program consisting of a technical session and workshop session. Attendees will interpret the thermograms for members of the public at dissemination centers at a later date.

The thermographic survey shall be conducted no later than 31 March 1982 to ensure adequate interior/exterior temperature differences for good heat loss indications. Delivery of the thermograms to the Government shall be within 2 months of the completion of the survey; i.e., no later than 31 May 1982.

The Contractor shall prepare a report at the conclusion of the survey and interpreter training seminar. This report shall discuss the planning/coordination (presurvey and postsurvey publicity that the Contractor participated in, flight line identification, house numbering by locals, coordination with local officials, etc.), the technical aspects of the survey (equipment used, ambient conditions, apparent anomalies, etc.), the training seminar (materials covered, number of participants, etc.), and conclusions and recommendations that might be of value for similar future surveys. Twenty five (25) copies and the unbound original of this report shall be submitted to the Government within 2 months of the completion of the survey; i.e., no later than 31 May 1982.

#### Aerial Thermography

If aerial thermography is used, ASHRAE Class B standards for airborne imaging shall apply. The Contractor will prepare level sliced thermograms for each community (light and dark areas corresponding to high and low heat losses, respectively) printed on photographic paper at a scale no smaller than 1 inch = 200 feet (i.e., 1 inch = 500 feet would not be acceptable).

#### Ground-Level Thermography

If ground-level thermography is used, ASHRAE Class B standards for exterior imaging shall apply. The Contractor will "shoot" the "street side" of residential units. Every reasonable effort shall be made to shoot as much of the street side as practical; specific problems might be expected in shooting the sill plate portion of the structure because of snow banks, bushes, or other obstacles.

The survey crew will record the address or, if the address is not available, some other identification (e.g., name on mailbox, position on block, etc.) for each residential building shot. The thermograms and "addresses" will be correlated after the survey to permit easy indexing and recall of any residence.

As part of the interpreters' training, the Contractor will furnish information on methods of making hard copy prints from the videotape playback equipment for interested owners -- e.g., suitable cameras, lenses, film, processing, techniques, etc.

The Contractor shall edit the thermography videotape(s) to group communities together for use at dissemination centers serving more than one community. As a hypothetical example, one tape might cover Dilworth and Glyndon; a second tape might include Rustad, Sabin, Horace, Briarwood, Frontier, and Prairie Rose; and a third tape might include Mapleton, Brooktree Park, Rivertree Park, Reile's Acres, North River, Argusville, Harwood, and Kragnes. The Contractor shall provide two (2) duplicates of the master videotape(s).

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